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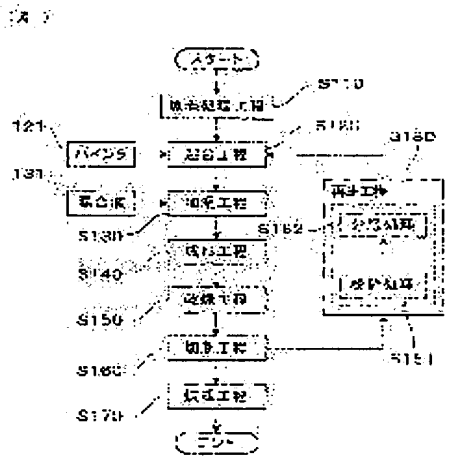
(54) REPRODUCED CERAMIC-FORMING RAW MATERIAL, AND METHOD OF PRODUCING CORDIERITE CERAMIC BODY USING THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a reproduced ceramic-forming raw material which causes no deterioration in the quality of a cordierite ceramic body, and to provide a method of producing a cordierite ceramic body using the same.
SOLUTION: The method of producing a cordierite ceramic body comprises: a mixing stage S120 where a ceramic-forming raw material and a binder are mixed to produce a mixed raw material; a humidification stage S130 where a mixed liquid is added to the mixed raw material to produce a humidified raw material; a molding stage S140 where the humidified raw material is kneaded, and is subjected to extrusion molding to form a ceramic molding; a drying stage S150 where the ceramic molding is dried; a cutting stage S160 where the unnecessary part of the ceramic molding is cut; and a firing stage S170 where the ceramic molding is fired. In the regeneration stage S180, among particles obtained by pulverizing the unnecessary part, the particles having particle diameters which do not reach the prescribed ones are removed, and the pulverized particles with the particle diameters in a prescribed range are produced. Then, as at least a part of the ceramic forming raw material in the mixing stage S120, the pulverized particles are used.



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CLAIMS

[Claim(s)]
[Claim 1]
While kneading the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
After performing grinding processing which grinds the above-mentioned unnecessary section produced in the above-mentioned cutting process, classification processing which removes the particle with which predetermined magnitude is not filled at least is performed, and the playback process which generates the grinding particle which consists of a particle belonging to the range of predetermined magnitude is carried out,
It is the manufacture approach of the cordierite ceramic object characterized by using the above-mentioned grinding particle as some above-mentioned ceramic-ized raw materials [at least] in the above-mentioned mixed process.
[Claim 2]
It is the manufacture approach of the cordierite ceramic object characterized by the content of the above-mentioned grinding particle being below 30 weight sections more than 1 weight section to the virgin raw material 100 weight section in claim 1 among the above-mentioned ceramic-ized raw materials of the above-mentioned mixed process.
[Claim 3]
It is the manufacture approach of the cordierite ceramic object characterized by being the honeycomb structure object with which the above-mentioned cordierite ceramic object has honeycomb structure in claim 1 or 2.
[Claim 4]
While kneading the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
By calcinating the above-mentioned unnecessary section produced in the above-mentioned cutting process, the above-mentioned binder inherent in this unnecessary section is vanished, it fine-particles-izes, and a fine-particles chemically-modified [which generates powder-like playback powder] degree is carried out,
It is the manufacture approach of the cordierite ceramic object characterized by using the above-mentioned playback powder as some above-mentioned ceramic-ized raw materials [at least] in the above-mentioned mixed process.

[Claim 5]
The manufacture approach of the cordierite ceramic object characterized by calcinating the above-mentioned unnecessary section in temperature of 600-degree-C or more 1000-degree-C or less ambient atmosphere to a fine-particles chemically-modified [above-mentioned] degree in claim 4.
[Claim 6]
The manufacture approach of the cordierite ceramic object characterized by changing the input of the above-mentioned binder in the above-mentioned mixed process, or the above-mentioned mixed liquor in the above-mentioned humidification process according to the content of the above-mentioned playback powder in the above-mentioned ceramic-ized raw material in claim 4 or 5.
[Claim 7]
It is the manufacture approach of the cordierite ceramic object characterized by the content of the above-mentioned playback powder being below 30 weight sections more than 1 weight section to the virgin raw material 100 weight section in any 1 term of claims 4-6 among the above-mentioned ceramic-ized raw materials of the above-mentioned mixed process.
[Claim 8]
It is the manufacture approach of the cordierite ceramic object characterized by being the honeycomb structure object with which the above-mentioned cordierite ceramic object has honeycomb structure in any 1 term of claims 4-7.
[Claim 9]
While kneading the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
The above-mentioned humidification process and the above-mentioned forming cycle are carried out in parallel with the making machine constituted so that it might extrude toward a die while they knead the above-mentioned mixed raw material,
The manufacture approach of the cordierite ceramic object characterized by supplying the above-mentioned mixed liquor to the above-mentioned making machine while supplying the above-mentioned unnecessary section produced in the above-mentioned cutting process to the above-mentioned making machine.
[Claim 10]
The manufacture approach of the cordierite ceramic object characterized by controlling the refrigeration capacity for cooling the above-mentioned humidification ingredient in the above-mentioned making machine in claim 9 according to the input of the above-mentioned unnecessary section supplied to the above-mentioned making machine.
[Claim 11]
It is the manufacture approach of the cordierite ceramic object characterized by being the honeycomb structure object with which the above-mentioned cordierite ceramic object has honeycomb structure in claim 9 or 10.
[Claim 12]
While kneading the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, The cutting process which cuts the unnecessary section of the above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, It is the playback ceramic-ized raw material reproduced from the above-mentioned unnecessary section produced in the production process of a cordierite ceramic object including the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object, or the defect desiccation article as a defective produced in the above-mentioned desiccation process,
This playback ceramic-ized raw material is a playback ceramic-ized raw material characterized by being the

grinding particle which consists of a particle belonging to the range of the predetermined magnitude obtained by removing at least the particle of the above-mentioned unnecessary section or the above-mentioned defect desiccation article with which predetermined magnitude is not filled while grinding either at least.

[Claim 13]

The upper limit of the cross section which carries out an abbreviation rectangular cross in claim 12 at the longitudinal direction of the above-mentioned grinding particle is a playback ceramic-ized raw material characterized by 1mm or more being 5mm or less.

[Claim 14]

It is the playback ceramic-ized raw material characterized by being the honeycomb structure object with which the above-mentioned cordierite ceramic object has honeycomb structure in claim 12 or 13.

[Claim 15]

While kneading the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, The cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, It is the playback ceramic-ized raw material reproduced from the above-mentioned unnecessary section produced in the production process of a cordierite ceramic object including the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object, or the defect desiccation article as a defective produced in the above-mentioned desiccation process,

This playback ceramic-ized raw material is a playback ceramic-ized raw material characterized by being the playback powder of the shape of powder which the above-mentioned binder which was inherent was vanished, fine-particles-ized, and was generated by [of the above-mentioned unnecessary section or the above-mentioned defect desiccation article] calcinating a flume gap or one side at least.

[Claim 16]

It is the playback ceramic-ized raw material characterized by calcinating the above-mentioned playback powder in claim 15 in temperature of 600-degree-C or more 1000-degree-C or less ambient atmosphere, and obtaining.

[Claim 17]

It is the playback ceramic-ized raw material characterized by being the honeycomb structure object with which the above-mentioned cordierite ceramic object has honeycomb structure in claim 15 or 16.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the manufacture approach of a cordierite ceramic object of having used the playback ceramic-ized raw material generated from the edge material produced in the production process of a cordierite ceramic object, and the playback ceramic-ized raw material.
[0002]
[Description of the Prior Art]
A cordierite ceramic has the outstanding heat characteristic that the coefficient of thermal expansion is low stable in a large temperature requirement while having the outstanding thermal resistance. Taking advantage of such a heat characteristic, the cordierite ceramic object of the honeycomb structure as catalyst support which removes harmful matter in an internal combustion engine's exhaust gas, such as HC, CO, and NOx, is developed.
[0003]
In manufacturing this cordierite ceramic object, a binder is introduced and slurred into virgin raw material powder, and this slurry is fabricated, it dries, and a desiccation Plastic solid is acquired. And the approach of producing a cordierite ceramic object by calcinating this desiccation Plastic solid is learned well conventionally.
[0004]
On the other hand, in the manufacture approach of a cordierite ceramic object, effective use of an edge material, a defective, etc. which are generated in a shaping process is called for from reduction of raw material cost, or a viewpoint of resource protection.
Then, the manufacture approach of a cordierite ceramic object of having used the playback ceramic-ized raw material reproduced from the dry material before baking in the above-mentioned production process is proposed (for example, patent reference 1 reference.).
[0005]
[Patent reference 1]
JP,3-72032,B (the eight - 11th page, the 6th table)
[0006]
[Problem(s) to be Solved]
However, there are the following problems in the manufacture approach of a cordierite ceramic object of having used the conventional playback ceramic-ized raw material. That is, with the cordierite ceramic object produced using the playback ceramic-ized raw material, as shown in the 6th table among the specification of the patent reference 1, a coefficient's of thermal expansion deteriorating (it becoming large) etc. and its quality may deteriorate.
[0007]
This invention was not made in view of this conventional trouble, and tends to offer the manufacture approach of the cordierite ceramic object using the playback ceramic-ized raw material and playback ceramic-ized raw material which do not produce degradation of the quality of a cordierite ceramic object.
[0008]
[Means for Solving the Problem]
While the 1st invention kneads the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification

raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
After performing grinding processing which grinds the above-mentioned unnecessary section produced in the above-mentioned cutting process, classification processing which removes the particle with which predetermined magnitude is not filled at least is performed, and the playback process which generates the grinding particle which consists of a particle belonging to the range of predetermined magnitude is carried out,
It is in the manufacture approach of the cordierite ceramic object characterized by using the above-mentioned grinding particle as some above-mentioned ceramic-ized raw materials [at least] in the above-mentioned mixed process (claim 1).
[0009]
It is characterized by removing the particle which is not filled with the manufacture approach of invention the above 1st into predetermined magnitude in the above-mentioned classification processing of the above-mentioned playback process among the particles which ground the above-mentioned unnecessary section, and generating the above-mentioned grinding particle.
And the effect which it has on the quality of the cordierite ceramic object to produce can be controlled by maintaining the magnitude of a grinding particle in the above-mentioned range.
That is, when particle size of a grinding particle was made fine too much, artificers searched for experimentally the significant correlation that the quality of a cordierite ceramic object deteriorated, and paid their attention to this relation.
[0010]
Moreover, the manufacture approach of invention the above 1st is characterized by mixing the above-mentioned ceramic-ized raw material which consists of the above-mentioned grinding particle generated at the above-mentioned playback process, and a virgin raw material, and the above-mentioned binder, and generating the above-mentioned mixed raw material in the above-mentioned mixed process.
That is, according to the manufacture approach of invention the above 1st, the existing manufacturing installation which deals with only a virgin raw material can be diverted as it is, and it is efficient.
[0011]
While the 2nd invention kneads the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
By calcinating the above-mentioned unnecessary section produced in the above-mentioned cutting process, the above-mentioned binder inherent in this unnecessary section is vanished, it fine-particles-izes, and a fine-particles chemically-modified [which generates powder-like playback powder] degree is carried out,
It is in the manufacture approach of the cordierite ceramic object characterized by using the above-mentioned playback powder as some above-mentioned ceramic-ized raw materials [at least] in the above-mentioned mixed process (claim 4).
[0012]
By the manufacture approach of invention the above 2nd, the above-mentioned unnecessary section collected to the fine-particles chemically-modified [above-mentioned] degree is calcinated and fine-particles-ized, and it is characterized by considering as the above-mentioned powder-like playback powder.
That is, according to the fine-particles chemically-modified [above-mentioned] degree, the above-mentioned powder-like playback powder is generable by disappearing the above-mentioned binder which the above-mentioned unnecessary section contains. There are few possibilities that the quality of the above-mentioned ceramic-ized raw material may deteriorate with the above-mentioned playback powder generated

without carrying out grinding etc. Moreover, the quality near a virgin raw material is realizable by removing a binder.
Therefore, a possibility of producing a difference of quality has few coefficients of thermal expansion etc. between the cordierite ceramic object manufactured using this playback powder, and the cordierite ceramic object manufactured only from the new article raw material.
[0013]
Furthermore, the manufacture approach of invention the above 2nd is characterized by mixing the above-mentioned playback powder and a virgin raw material, and using as the above-mentioned ceramic-ized raw material in the above-mentioned mixed process.
That is, according to this manufacture approach, the existing manufacturing installation which deals with only a virgin raw material can be diverted, and it is efficient.
[0014]
While the 3rd invention kneads the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, In the manufacture approach of a cordierite ceramic object including the cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, and the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,
The above-mentioned humidification process and the above-mentioned forming cycle are carried out in parallel with the making machine constituted so that it might extrude toward a die while they knead the above-mentioned mixed raw material,
While supplying the above-mentioned unnecessary section produced in the above-mentioned cutting process to the above-mentioned making machine, it is in the manufacture approach of the cordierite ceramic object characterized by supplying the above-mentioned mixed liquor to the above-mentioned making machine (claim 9).
[0015]
The manufacture approach of invention the above 3rd is characterized by supplying and carrying out retempering of the above-mentioned unnecessary section to the above-mentioned making machine directly.
That is, retempering of this approach is directly carried out with the above-mentioned making machine, without also performing any processing to the above-mentioned unnecessary section. According to retempering, there are few possibilities of degrading the ceramic-ized raw material and binder which were contained in the unnecessary section.
[0016]
Therefore, according to the 3rd above-mentioned invention, there are few possibilities that the coefficient of thermal expansion of the produced cordierite ceramic object may deteriorate. Furthermore, according to this approach, not only the ceramic-ized raw material contained in the above-mentioned unnecessary section but the above-mentioned binder is reusable.
However, by this manufacture approach, since kneading of the above-mentioned unnecessary section which carried out desiccation hardening becomes indispensable, strengthening of a cooling system etc. has the case coping with strengthening of the kneading torque of the above-mentioned making machine, and generation of heat at the time of kneading where the reconstruction by the side of equipment is needed, for example.
[0017]
While the 4th invention kneads the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, The cutting process which cuts the unnecessary section of the above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, It is the playback ceramic-ized raw material reproduced from the above-mentioned unnecessary section produced in the production process of a cordierite ceramic object including the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object,

or the defect desiccation article as a defective produced in the above-mentioned desiccation process,
This playback ceramic-ized raw material is in the playback ceramic-ized raw material characterized by being the grinding particle which consists of a particle belonging to the range of the predetermined magnitude obtained by removing at least the particle of the above-mentioned unnecessary section or the above-mentioned defect desiccation article with which predetermined magnitude is not filled while grinding either at least (claim 12).
[0018]
The playback ceramic-ized raw material of invention of the above 4th is the above-mentioned grinding particle which removed and refined at least the particle with which predetermined magnitude is not filled from the particle which ground and obtained the above-mentioned unnecessary section produced in the above-mentioned cutting process, or the above-mentioned defect desiccation article produced in the above-mentioned desiccation process.
And application to the production process using the existing virgin raw material is easy for this playback ceramic-ized raw material, and it is the ingredient which can manufacture the cordierite ceramic object which was excellent in the coefficient of thermal expansion.
[0019]
While the 5th invention kneads the mixed process which mixes a ceramic-ized raw material and a binder and generates a mixed raw material, the humidification process which adds mixed liquor to the above-mentioned mixed raw material, and generates a humidification raw material, and the above-mentioned humidification raw material The forming cycle which fabricates a ceramic Plastic solid by extrusion molding, and the desiccation process which dries the above-mentioned ceramic Plastic solid, The cutting process which cuts the unnecessary section of the dried above-mentioned ceramic Plastic solid, and carries out cutting processing of the above-mentioned ceramic Plastic solid at predetermined die length, It is the playback ceramic-ized raw material reproduced from the above-mentioned unnecessary section produced in the production process of a cordierite ceramic object including the baking process which calcinates the above-mentioned ceramic Plastic solid of predetermined die length, and generates a ceramic baking object, or the defect desiccation article as a defective produced in the above-mentioned desiccation process,
By [of the above-mentioned unnecessary section or the above-mentioned defect desiccation article] calcinating a flume gap or one side at least, this playback ceramic-ized raw material vanishes the above-mentioned binder which was inherent, and is in the playback ceramic-ized raw material characterized by being the playback powder of the shape of powder which fine-particles-ized and was generated (claim 15).
[0020]
The playback ceramic-ized raw material of invention of the above 5th calcinates and fine-particles-izes the collected above-mentioned unnecessary section, and uses it as powder-like playback powder. That is, there are few possibilities that the quality of the above-mentioned ceramic-ized raw material may deteriorate with the above-mentioned playback powder reproduced without carrying out grinding etc. Moreover, the playback ceramic-ized raw material near a virgin raw material is generable by vanishing a binder. Therefore, there are few possibilities of producing a difference of quality, such as a coefficient of thermal expansion, between the cordierite ceramic object manufactured using this playback powder, and the cordierite ceramic object manufactured only from the new article raw material.
[0021]
[Embodiment of the Invention]
In the 1st above-mentioned invention, the upper limit in the cross-section configuration which carries out an abbreviation rectangular cross can be defined as the longitudinal direction of the above-mentioned grinding particle as magnitude of the above-mentioned grinding particle, for example. Hereafter, the magnitude of the above-mentioned grinding particle is suitably indicated as a particle size of a grinding particle.
And as for the particle size of the above-mentioned grinding particle, it is desirable to be referred to as 1mm or more 5mm or less. By setting particle size of the above-mentioned grinding particle to 1mm or more, the coefficient of thermal expansion of the produced above-mentioned cordierite ceramic object etc. can control degradation of quality. Moreover, while being able to control various troubles in the above-mentioned forming cycle by setting particle size to 5mm or less, general air conveyance as the conveyance approach of a powdery part can be used efficiently, for example.
[0022]
Although the example 2 mentioned later explained in detail, artificers are in the point that the critical point where the coefficient of thermal expansion of a cordierite ceramic object deteriorates is the particle size of 1mm of a grinding particle, through various experiments conducted wholeheartedly, and the ceramic

cordierite object produced from the grinding particle with a particle size of less than 1mm found out that quality was inferior.

[0023]

And the grinding particle to which particle size exceeds 5mm has a possibility of forming a still huger secondary particle by condensation, and has a possibility of inducing faults, such as blinding of a die, in the above-mentioned forming cycle.

Furthermore, if particle size exceeds 5mm, the clearance between the above-mentioned grinding particles will become large, for example, an air omission is produced in air conveyance, and there is a possibility that conveyance effectiveness may fall.

[0024]

In addition, it can also carry out combining the processing which removes the particle exceeding predetermined magnitude to the processing which removes the particle with which the above-mentioned predetermined magnitude is not filled as the above-mentioned classification processing. In this case, the particle not only exceeding the particle with which predetermined magnitude is not filled but predetermined magnitude can be removed, and the magnitude of the above-mentioned grinding particle can be certainly stored within the limits of predetermined.

[0025]

Moreover, as this classification processing, it can carry out with the filter which has a strainer etc., for example. What is necessary is to remove the particle which passed the above-mentioned strainer among particles, and just to dissociate, in order to remove the particle with which a predetermined particle size is not filled. What is necessary is on the other hand, to remove the particle which did not pass the above-mentioned strainer but remained to the filter, and just to dissociate, in order to remove the particle exceeding a predetermined particle.

Moreover, the above-mentioned classification processing can also be carried out like the above by an air-current classification besides the approach of carrying out using a filter etc.

[0026]

Here, it is difficult to classify particle size perfectly by any classification processing. That is, the above-mentioned classification processing in the 1st above-mentioned invention is processing carried out using the equipment which aimed at the operation effectiveness of classifying a predetermined particle size, and was constituted physically.

Therefore, **** rare ****** has by chance the particle with which a predetermined particle size is not filled a little in the particle group sorted out.

Therefore, it cannot be overemphasized that the above-mentioned grinding particle in the 1st above-mentioned invention is a concept included also when the particle which is not restricted when all particles have a desired particle size, but separates from a desired particle size also the property top of the above-mentioned classification processing and after classification processing contains a little.

[0027]

Furthermore, the above-mentioned mixed liquor applied to the above-mentioned humidification process is an additive for improving the lubricity of the ingredient in the above-mentioned forming cycle etc. And as this mixed liquor, what mixed oily oils, such as salad oil, soluble oil, etc. can be used.

[0028]

Moreover, it is desirable among the above-mentioned ceramic-ized raw materials of the above-mentioned mixed process that the content of the above-mentioned grinding particle is below 30 weight sections more than 1 weight section to the virgin raw material 100 weight section (claim 2).

Here, the above-mentioned grinding particle which pulverized the dry above-mentioned ceramic Plastic solid is in the condition that it was "smooth" it. However, the primary particle in the above-mentioned grinding particle is covered with the binder which once melted and became film-like.

Therefore, if the above-mentioned mixed liquor which consists of water, an oil, etc. in the above-mentioned humidification process, and the above-mentioned grinding particle come into contact with, the binder of the shape of above film demonstrates adhesiveness, and will be carried out "all over" by the above-mentioned grinding particle itself. When it does so, there is a possibility that these grinding particles may paste up mutually and they may generate a huge secondary particle.

[0029]

When the content of the above-mentioned grinding particle is below 30 weight sections more than 1 weight section and virgin raw material powder exists in large quantities to a grinding particle to the virgin raw material 100 weight section, the front face of the grinding particle carried out "all over" can be worn with

virgin raw material powder like the above. And each grinding particle changes into the condition like rice cake" which sprinkled "soybean flour that it was "smooth" it.
[0030]
Therefore, condensation of the grinding particle in a humidification process can be controlled in this case. And if condensation of a grinding particle is controlled, there is a possibility that a huge secondary particle may be formed and it may be generated, for example, before-it-happens prevention of the various problems, such as aggravation of a moldability, and blinding of a die, plugging of a making machine, can be carried out.
[0031]
Moreover, it is desirable that the above-mentioned cordierite ceramic object is a honeycomb structure object which has honeycomb structure (claim 3).
In this case, the above-mentioned cordierite ceramic object tends to produce distortion, a crack, etc. by heat, and becomes especially effective [the operation effectiveness by the 1st above-mentioned invention that a coefficient of thermal expansion is maintainable good].
[0032]
In the manufacture approach of the cordierite ceramic object invention the above 2nd, it is desirable to a fine-particles chemically-modified [above-mentioned] degree to calcinate the above-mentioned unnecessary section in temperature of 600-degree-C or more 1000-degree-C or less ambient atmosphere (claim 5).
In this case, the above-mentioned binder contained in the above-mentioned unnecessary section can be vanished appropriately.
[0033]
When temperature is less than 600 degrees C, there is a possibility that the above-mentioned binder contained in the above-mentioned unnecessary section may be completely unremovable.
On the other hand, when temperature exceeds 1000 degrees C, there is a possibility that the ceramic ingredient which composes the above-mentioned unnecessary section may sinter.
In addition, it is good more preferably in temperature of 600-degree-C or more 700-degree-C or less ambient atmosphere to calcinate the above-mentioned unnecessary section.
In this case, evapotranspiration of the water of crystallization in the above-mentioned playback powder can be controlled.
[0034]
Moreover, it is desirable to change the input of the above-mentioned binder in the above-mentioned mixed process or the above-mentioned mixed liquor in the above-mentioned humidification process according to the content of the above-mentioned playback powder in the above-mentioned ceramic-ized raw material (claim 6).
Here, with the above-mentioned playback powder, internal water of crystallization transpires by baking, and there is a possibility of running short. And from the above-mentioned humidification raw material which consists of the above-mentioned ceramic-ized raw material containing playback powder, there is a possibility that the lubricity in the above-mentioned forming cycle may run short.
[0035]
So, when changing the input of the above-mentioned binder or the above-mentioned mixed liquor according to the content of the above-mentioned playback powder in the above-mentioned ceramic-ized raw material, the lubricity of the above-mentioned humidification raw material in the above-mentioned forming cycle can be compensated by the above-mentioned binder or the above-mentioned mixed liquor.
That is, it is so desirable that the content of the above-mentioned playback powder in the above-mentioned ceramic-ized raw material is high to increase the quantity of the input of the above-mentioned mixed liquor.
[0036]
Moreover, it is desirable among the above-mentioned ceramic-ized raw materials of the above-mentioned mixed process that the content of the above-mentioned playback powder is below 30 weight sections more than 1 weight section to the virgin raw material 100 weight section (claim 7).
In this case, the difference in the quality of the cordierite ceramic object manufactured by the manufacture approach of invention the above 2nd and the cordierite ceramic object manufactured only using the virgin raw material can be controlled further.
Moreover, if it is the range of the above-mentioned content, since the general rate of the ingredient yield in the production process of a cordierite ceramic object is adjusted good, the production process by the manufacture approach of invention the above 2nd can be continued stably and efficiently.

[0037]
Moreover, it is desirable that the above-mentioned cordierite ceramic object is a honeycomb structure object which has honeycomb structure (claim 8).
In this case, the above-mentioned cordierite ceramic object tends to produce the crack by heat distortion etc., and becomes especially effective [the operation effectiveness by the 1st above-mentioned invention of maintaining a coefficient of thermal expansion good].
[0038]
In the manufacture approach of the invention cordierite ceramic object the above 3rd, it is desirable to control the refrigeration capacity for cooling the above-mentioned humidification ingredient in the above-mentioned making machine according to the input of the above-mentioned unnecessary section supplied to the above-mentioned making machine (claim 10).
[0039]
In this case, powerful kneading torque is needed and the calorific value at the time of kneading can also knead the above-mentioned large unnecessary section appropriately. And deterioration of the above-mentioned humidification ingredient can be beforehand prevented by inhibiting the temperature rise at the time of kneading.
That is, it is so good that there are many inputs of the above-mentioned unnecessary section in order to hold the temperature of the above-mentioned humidification ingredient in the above-mentioned making machine to abbreviation regularity to enlarge refrigeration capacity which cools the above-mentioned humidification ingredient in the above-mentioned making machine.
[0040]
Moreover, it is desirable that the above-mentioned cordierite ceramic object is a honeycomb structure object which has honeycomb structure (claim 11).
In this case, it is easy to produce distortion, a crack, etc. by heat, and the operation effectiveness by the 3rd above-mentioned invention of maintaining a coefficient of thermal expansion good becomes effective especially.
[0041]
In the 4th above-mentioned invention, the upper limit in the cross-section configuration which carries out an abbreviation rectangular cross can be defined as the longitudinal direction of the above-mentioned grinding particle as magnitude of the above-mentioned grinding particle, for example.
[0042]
Moreover, it is desirable that the upper limit of the cross section which carries out an abbreviation rectangular cross at the longitudinal direction of the above-mentioned grinding particle is 1mm or more 5mm or less (claim 13).
In this case, as explained in the 1st above-mentioned invention, there are few possibilities that degradation of quality, such as degradation of a coefficient of thermal expansion, may arise, about the produced ceramic cordierite object.
In addition, the above-mentioned upper limit is suitably expressed as the particle size of the above-mentioned grinding particle.
[0043]
There are few possibilities of forming a still huger secondary particle by condensation of the above-mentioned grinding particle, and there are few possibilities of inducing faults, such as blinding of a die, in the above-mentioned forming cycle.
Furthermore, general air conveyance as the conveyance approach of the ingredient which presents the shape for example, of a particle can be efficiently used by setting particle size of the above-mentioned grinding particle to 5mm or less.
[0044]
When a particle with a particle size of less than 1mm is included in the above-mentioned grinding particle, there is a possibility that the coefficient of thermal expansion of the produced above-mentioned cordierite ceramic object etc. may deteriorate.
On the other hand, when the particle exceeding the particle size of 5mm is included in the above-mentioned grinding particle, there is a possibility that the huge secondary particle by condensation of a grinding particle may do a bad influence by the above-mentioned forming cycle.
Furthermore, in air conveyance which the clearance between grinding particles becomes large, for example, feeds air in conveyance tubing, and conveys the ingredient in conveyance tubing, there is a possibility that may produce an air omission and conveyance effectiveness may fall.

[0045]
Moreover, it is desirable that the above-mentioned cordierite ceramic object is a honeycomb structure object which has honeycomb structure (claim 14).
In this case, the operation effectiveness by the 4th above-mentioned invention that a coefficient of thermal expansion is maintainable good becomes effective especially as a raw material of the cordierite ceramic object of the honeycomb structure which is easy to produce distortion, a crack, etc. by heat.
[0046]
In the playback ceramic-ized raw material of invention of the above 5th, it is desirable to calcinate the above-mentioned playback powder in temperature of 600-degree-C or more 1000-degree-C or less ambient atmosphere, and to obtain (claim 16).
In this case, the above-mentioned binder contained in the above-mentioned unnecessary section is appropriately removable.
When temperature is less than 600 degrees C, there is a possibility that the above-mentioned binder contained in the above-mentioned unnecessary section may be completely unremovable.
On the other hand, when temperature exceeds 1000 degrees C, there is a possibility that the ceramic ingredient which composes the above-mentioned unnecessary section may sinter.
[0047]
Moreover, it is desirable that the above-mentioned cordierite ceramic object is a honeycomb structure object which has honeycomb structure (claim 17).
In this case, the operation effectiveness by the 5th above-mentioned invention that a coefficient of thermal expansion is maintainable good becomes effective especially as a raw material of the cordierite ceramic object of the honeycomb structure which is easy to produce distortion, a crack, etc. by heat.
[0048]
[Example]
(Example 1)
The manufacture approach of the cordierite ceramic object 8 (drawing 2) of this example is explained using drawing 1 - drawing 6 .
The manufacture approach of the cordierite ceramic object 8 of this example The mixed process S120 which mixes the ceramic-ized raw material 71 and a binder 121, and generates the mixed raw material 72 as shown in drawing 1 , While kneading the humidification process S130 which adds mixed liquor 131 to the above-mentioned mixed raw material 72, and generates the humidification raw material 73, and the above-mentioned humidification raw material 73 The forming cycle S140 (drawing 4) which fabricates ceramic Plastic solid 88 by extrusion molding, The desiccation process S150 which dries ceramic Plastic solid 88, and the unnecessary section 888 of ceramic Plastic solid 88 are cut. The cutting process S160 (drawing 5) which carries out cutting processing of above-mentioned ceramic Plastic solid 88 at predetermined die length, and the baking process S170 which calcinates ceramic Plastic solid 88 and generates the ceramic baking object 880 are included.
[0049]
Furthermore, after performing grinding processing S181 which grinds the unnecessary section 888 produced in the above-mentioned cutting process S160, classification processing S182 which removes the particle with which predetermined magnitude is not filled at least is performed, and the playback process S180 which generates the grinding particle 74 which consists of a particle belonging to the range of predetermined magnitude is carried out.
and the above-mentioned ceramic-ized raw material 71 of the above-mentioned mixed process S120 -- as a part, the above-mentioned grinding particle 74 is used at least.
Hereafter, these contents are explained in detail.
[0050]
In this example, the cordierite ceramic object 8 is manufactured like the above using the ceramic-ized raw material 71 containing the above-mentioned grinding particle 74 as a playback ceramic-ized raw material by the production process which combined the mixed process S120, the humidification process S130, the forming cycle S140, the desiccation process S150, the cutting process S160, and the baking process S170.
[0051]
Especially, in the grinding processing S181 of the above-mentioned playback process S180 of this example, the above-mentioned unnecessary section 888 is ground so that the upper limit (it is hereafter indicated as particle size suitably.) of the cross section which carries out an abbreviation rectangular cross may be set to 5mm or less at the longitudinal direction of a particle. And in the above-mentioned classification processing

S182, it has the description at the point of removing a particle with a particle size of less than 1mm, at least. And the combination of the grinding processing S181 and the classification processing S182 generates the grinding particle 74 which consists of a particle with a particle size of 1mm - 5mm.
[0052]
The cordierite ceramic object 8 produced by this example has an envelope 81, the septum 82 arranged in the shape of a grid in this envelope 81, and the cel 80 of a large number which it was divided by this septum 82 and penetrated to shaft orientations, as shown in drawing 2 .
And the new ceramics-ized raw material 70 used by this example consists of each powder of the talc which is the component which can serve as cordierite, a kaolin, and an alumina after baking.
[0053]
In this example, first, as shown in drawing 3 , the raw material down stream processing S110 (drawing 1) which is a last process of the mixed process S120 generates the virgin raw material 70 of the 100 weight sections from each raw material powder of the talc of 38 weight sections, the kaolin of 42 weight sections, and the alumina of 20 weight sections.
[0054]
In this raw material down stream processing S110, first, as shown in drawing 3 , a proper quantity of powder is measured, respectively and raw material powder is obtained from each dispensers 111-115 holding each above-mentioned raw material powder. And the above-mentioned raw material powder fed into the mixing vessel 117 and the water supplied from the feed pipe 119 are agitated by the churning feather 118, and the virgin slurry-like raw material 70 is generated.
[0055]
Next, at the mixed process S120, the ceramic-ized raw material 71 which consists of the powder particle 74 and the virgin raw material 70 which are a playback-ized ceramic raw material which processed the above-mentioned unnecessary section 888, and the powder-like binder 121 are mixed. This mixed process was carried out using mixing equipment.
[0056]
the powder first obtained from the methyl cellulose powder as a binder 121, and the virgin slurry-like raw material 70 at this mixed process S120, and the above-mentioned grinding particle 74 -- the inside of each air conveying pipe 122-124 is fed by high-pressure air, and each is supplied in a mixing chamber 125. In addition, in this example, the above-mentioned powder was obtained using slurry dryers, such as a paddle dryer, a fluidized-bed-drying machine, and a spray dryer.
[0057]
And in this example, the grinding particle 74 of 10 weight sections was doubled with the virgin raw material 70 to this virgin raw material 100 weight section, and it considered as the ceramic-ized raw material 71 in the mixed process S120.
Moreover, the virgin raw material 70, the grinding particle 74, and a binder 121 may be mixed to coincidence like this example. And in the process to mix, it can also be grasped that the above-mentioned ceramic-ized raw material 71 is generated. It replaces with this, and after mixing beforehand and using the virgin raw material 70 and the grinding particle 74 as the above-mentioned ceramic-ized raw material 71, this ceramic-ized raw material 71 and binder 121 are also mixable.
[0058]
And after throwing in each raw material of the shape of powder in the dryness of the specified quantity in a mixing chamber 125, high-pressure air is injected into a mixing chamber 125 from the air pressure feeder 126. And this high-pressure air generates the above-mentioned mixed raw material 72 which mixed each raw material powder to abbreviation homogeneity by dispersing each raw material powder in a mixing chamber 125.
[0059]
Next, at the above-mentioned humidification process S130, mixed liquor 131 is added to the mixed raw material 72, and the humidification raw material 73 is generated. In this example, the liquid which mixed the polyoxyethylene polyoxypropylene monobutyl ether and water was used as the above-mentioned mixed liquor 131.
According to this mixed liquor 131, the lubricity of the humidification raw material 73 is improved and the extrusion nature in the above-mentioned forming cycle S140 and a moldability can be made good.
[0060]
Next, in a forming cycle S140, as shown in drawing 4 , extrusion molding of ceramic Plastic solid 88 is carried out using a making machine 14. This making machine 14 consists of a kneading machine 143,145

which kneads the humidification raw material 73, and an extruder 141 of the screw type which extrudes the humidification raw material 73 toward the die 443 mentioned later.
[0061]
The kneading machine 143 and the extruder 141 have the screw 432,442 which winds the piece 435,445 of a screw spirally and serves as the cylinder-like frame 431,441, as shown in drawing 4 .
Moreover, the kneading machine 145 has the cylinder-like frame 451 and the screw 452, as shown in this drawing. This screw 452 has the screw section 456 which comes to wind the piece 455 of a screw around both ends, and the approximately cylindrical major diameter 458 which formed the shear slot 459 of abbreviation constant width over the periphery perimeter. And the shear gear tooth 457 which projects in the shape of a ring is formed in the inner skin of a frame 451 so that it may eat into the above-mentioned shear slot 459.
[0062]
As shown in the kneading machine 145 of this example at drawing 4 , the shear section 454 which combined the shear slot 459 and the shear gear tooth 457 is formed in the location of two shaft orientations.
In addition, the screw 432,442,452 is constituted so that it may rotate by the motor which was connected to the back end side, respectively and which is not illustrated.
[0063]
Moreover, the upper part of the frame 451 of a kneading machine 145 is made to have carried out opening of the ingredient input port 145 equipped with the pushing roller 459 constituted so that the thrown-in raw material might be stuffed into the interior, as shown in drawing 4 . And the humidification raw material 73 grade supplied from ingredient input port 145 is kneaded, and the kneading machine 145 is constituted so that it may extrude towards a filter 453.
Here, shearing which this shear section 454 does so constitutes the shear section 454 arranged on the periphery of the major diameter 458 of a screw 452 so that the internal humidification raw material 73 can fully be kneaded.
[0064]
Moreover, as shown in drawing 4 , opening of the ingredient input port 144 equipped with the pushing roller 439 has been carried out to the upper part of the frame 431 of the above-mentioned kneading machine 143. And the humidification raw material 73 extruded from the kneading machine 145 is constituted so that a kneading machine 143 may be supplied through ingredient input port 144.
[0065]
Moreover, as shown in drawing 4 , the kneaded humidification raw material 73 is turned to the filter 433 at a tip, and a kneading machine 143 extrudes it, and it constitutes it so that the ingredient input port 146 of an extruder 141 may be supplied. In addition, the vacuum pump 149 which deaerates the ingredient input port 146 circumference is connected to this extruder 141. And degassing constitutes so that the contamination of the air to the humidification raw material 73 can be controlled.
[0066]
The extruder 141 is constituted so that the humidification raw material 73 kneaded by the kneading machine 143 may be turned to a die 443 and may be advanced further. In this example, the slit 444 of the shape of a grid corresponding to the septum 82 of ceramic Plastic solid 88 to produce is formed in the interior of a die 443.
And based on the internal structure of the die 443 equipped with the slit 444, the extruder 141 is constituted so that ceramic Plastic solid 88 as a honeycomb structure object can be fabricated.
[0067]
Next, ceramic Plastic solid 88 which carried out extrusion molding is thrown into the above-mentioned desiccation process S150. This desiccation process S150 was carried out using the dryer which consists of a desiccation tub equipped with the microwave generator and which is not illustrated.
At this process, beforehand, ceramic Plastic solid 88 is suitably cut so that it can supply to the above-mentioned desiccation tub. In this example, as shown in drawing 5 , the wire cutting machine 15 constituted so that attitude movement of a wire 151 might cut argillaceous ceramic Plastic solid 88 was used.
And cut ceramic Plastic solid 88 is thrown into the above-mentioned desiccation tub, and microwave is irradiated. By irradiating microwave, the moisture which argillaceous ceramic Plastic solid 88 contains is transpired, and ceramic Plastic solid 88 is dried.
[0068]
Next, like the above, in order to correct the both-ends side of dry above-mentioned ceramic Plastic solid 88, the above-mentioned cutting process S160 is carried out. At this process, the both-ends side of dried ceramic

Plastic solid 88 is cut off, and ceramic Plastic solid 88 used as the cordierite ceramic object 8 (drawing 2) as a final product is acquired.
That is, in ceramic Plastic solid 88 after desiccation, the distortion at the time of the wire cutting machine 15 cutting remains in the septum 82 grade near both ends. Then, while exposing the end face which consists of a septum 82 with little distortion by cutting off the unnecessary section 888 of both ends suitably, the die length of ceramic Plastic solid 88 is made to agree in the dimension as a final product.
In this example, the diamond cutter which is not illustrated cut ceramic Plastic solid 88 after desiccation.
[0069]
Next, the above-mentioned baking process S170 is carried out, above-mentioned ceramic Plastic solid 88 is calcinated, and the cordierite ceramic object 8 as a final product is produced.
On the other hand, the above-mentioned playback process S180 is carried out as a back process of the above-mentioned cutting process S160. At this playback process S180, the collected above-mentioned unnecessary section 888 is ground, and the grinding particle 74 which consists of a particle of a predetermined size range is generated.
[0070]
The playback process S180 of this example consists of grinding processing S181 and classification processing S182, as shown in drawing 1 . Grinding processing S181 was carried out using the roll crusher 18 which has arranged the mesh 189 which has the mesh of 5mm angle to the downstream of body of revolution 181 while arranging the body of revolution 181 of 2 pairs which have the grinding feather 182 in a peripheral face to abbreviation parallel, as shown in drawing 6 .
[0071]
As shown in drawing 6 , this roll crusher 18 is constituted so that the unnecessary section 888 supplied to the gap of the body of revolution 181 of a pair may be drawn in the inner direction, and each body of revolution 181 may be rotated. And by rubbing the unnecessary section 888 against a mesh 189, and passing a mesh by rotation actuation of body of revolution 181, it constitutes so that a particle with a particle size of 5mm or less may be obtained.
[0072]
And in the above-mentioned classification processing S182, as shown in drawing 6 , the above-mentioned grinding particle 74 as a playback ceramic-ized raw material was generated using the filter 188 equipped with the strainer which has the mesh which presents the one-side shape of a 1mm abbreviation square.
Here, the above-mentioned filter 188 classified and removed the particle obtained by the above-mentioned grinding processing S181, and what remained to this filter 188 was made into the above-mentioned grinding particle 74. According to the classification processing S182 of this example, the grinding particle 74 of the shape of a scale with a particle size of 1mm or more is generable.
And by the manufacture approach of this example, the generated grinding particle 74 is reused like the above as some ceramic-ized raw materials 71 of the above-mentioned mixed process S120.
[0073]
As mentioned above, at the mixed process S120 of the cordierite ceramic object 8 of this example, the above-mentioned ceramic-ized raw material 71 which consists of the above-mentioned grinding particle 74 and the virgin raw material 70 which were generated according to the above-mentioned playback process S180, and the methyl cellulose as the above-mentioned binder 121 are mixed, and the above-mentioned mixed raw material 72 is generated.
[0074]
Therefore, the above-mentioned unnecessary section 888 cut off from ceramic Plastic solid 88 after the above-mentioned desiccation can be reused, and productive efficiency is high.
Moreover, the above-mentioned mixed process S120 can divert the established manufacturing installation which deals with only the virgin raw material 70, and is efficient.
[0075]
Furthermore, at the playback process S180 of this example, the above-mentioned unnecessary section 888 is ground and classified to a particle with a particle size of 1-5mm, and the grinding particle 74 is generated.
As the grinding particle 74 of the shape of a scale with a particle size of 1mm or more shows to the example 2 mentioned later, there are few possibilities that the primary particle contained in the above-mentioned unnecessary section 888 may be made detailed, and there is also little degradation of the coefficient of thermal expansion of the produced cordierite ceramic object 8.
Furthermore, according to the grinding particle 74 with a particle size of 5mm or less, there are few possibilities of producing an air omission etc., also at the time of conveyance by air feeding, and they can

convey to the above-mentioned mixing equipment efficiently at it.
[0076]
(Example 2)
This example explains using various experiments and the experimental data of those that effectiveness of maintaining the particle size of the above-mentioned grinding particle as a playback ceramic-ized raw material in an example 1 to 1mm or more should be made clear.
As the 1st experiment, the above-mentioned unnecessary section produced from the ceramic Plastic solid after desiccation was ground to several sorts of grinding particles from which the particle size to the mean particle diameter of 0.2mm - 6mm differs. And the cordierite ceramic object was produced from the ceramic-ized raw material which consists only of each grinding particle.
And as a result of measuring the coefficient of thermal expansion of each cordierite ceramic object, between the particle size of a grinding particle, and the coefficient of thermal expansion of the produced cordierite ceramic object, it was able to find out that there was a high correlation.
[0077]
That is, according to drawing 7 by which the coefficient of thermal expansion of the cordierite ceramic object which produced the mean diameter of the applied grinding particle on the axis of abscissa is shown on an axis of ordinate, it turns out that the coefficient of thermal expansion of a cordierite ceramic object has deteriorated [the mean diameter of a grinding particle] rapidly in less than 1mm (it becomes large). In addition, as a coefficient of thermal expansion shown in this drawing, the coefficient of thermal expansion in the range of 40-80 degrees C is shown.
And according to this drawing, when particle size of a grinding particle is enlarged, there is an inclination for a coefficient of thermal expansion to become small, but it turns out that it is less than the coefficient of thermal expansion (a dotted line shows among this drawing.) of the cordierite ceramic object which consists only of a virgin raw material also considering a mean diameter as 5mm.
[0078]
Then, in order to solve the cause of correlation with the particle size of a grinding particle, and a coefficient of thermal expansion as the 2nd experiment, it investigated what kind of difference exists in two sorts of ceramic-ized raw materials which consist of two sorts of grinding particles from which particle size is different.
Here, many properties were analyzed about the ceramic-ized raw material which consists of a grinding particle classified in the particle size of 1mm or more, and each grinding particle classified in the particle size of less than 1mm.
[0079]
Consequently, like the above, from two sorts of ceramic-ized raw materials which consist of grinding particles from which particle size differs, as shown in drawing 8 R> 8, it became clear that the particle size distribution of a primary particle differed greatly.
namely, according to this drawing the particle diameter of a primary particle being shown on an axis of abscissa, and showing the incidence on an axis of ordinate, from the ceramic-ized raw material (a continuous line shows among this drawing.) which consists of a grinding particle with a particle size of 1mm or more The ceramic-ized raw material which becomes the particle diameter of about 19 micrometers from a grinding particle with a particle size of less than 1mm to the peak of the incidence appearing (a dotted line shows among this drawing.) The peak near 19 micrometer is controlled.
That is, from the ceramic-ized raw material which consists of a grinding particle with a particle size of less than 1mm, the primary particle is made detailed.
[0080]
On the other hand, as shown in drawing 9 , the particle size distribution of the primary particle for every component which constitutes the virgin raw material applied to the example 1 was investigated as the 3rd experiment. The particle diameter of a primary particle is shown on an axis of abscissa among this drawing, and the incidence is shown on the axis of ordinate.
In addition, the each first particle size distribution of talc, a kaolin, and an alumina is shown in this drawing with the continuous line, the two-dot chain line, and the dotted line, respectively.
That the incidence peak of the diameter distribution of a primary particle of the talc which is the component ratio 38 weight section actualizes can grasp clearly the incidence peak (drawing 8) which appears near [in the particle size distribution of a virgin raw material] 19 micrometer from the particle size distribution shown in drawing 9 .
[0081]

Then, the ceramic-ized raw material which contains the talc which made detailed the incidence peak of the diameter of a primary particle near 9.5 micrometer as the 4th experiment which investigates the effect which detailed-ization of the diameter of a primary particle does, and the ceramic-ized raw material containing the talc which has an incidence peak near 19 micrometer were prepared. And many properties of the cordierite ceramic object produced from both ceramic-ized raw materials were compared.

[0082]

Consequently, as shown in drawing 10 , it turned out that the magnitude of the diameter of a primary particle of talc has the serious effect for the amount of preferred orientation showing the degree of the orientation of the primary particle in a cordierite ceramic object, and a coefficient of thermal expansion. The coefficient of thermal expansion of a cordierite ceramic object is shown on an axis of abscissa among this drawing, and the amount of preferred orientation of a primary particle is shown on the axis of ordinate. In addition, this amount of preferred orientation is the value which ** X-ray intensity of a field (110) by the sum of the X-ray intensity of a field (002), and the X-ray intensity of a field (110), and can be found.

[0083]

According to this drawing, with the cordierite ceramic object (the point plotting [black] shows among this drawing) containing the talc which has an incidence peak near 9.5 micrometer, there is an inclination for the amount of preferred orientation of a primary particle to become small, and for the coefficient of thermal expansion to be large as compared with the cordierite ceramic object (for the point plotting [void] to show among this drawing) which consists of talc with a mean particle diameter of 19 micrometers.

That is, according to drawing 10 , the amount of preferred orientation falls by detailed-ization of the primary particle of a ceramic-ized raw material, and the mechanism of the debasement of the cordierite ceramic object that originate in the fall of the amount of preferred orientation, and a coefficient of thermal expansion becomes large is proved.

[0084]

The following knowledge can be acquired through each experiment of this example.

That is, as shown in drawing 10 , when the diameter of a primary particle of a ceramic-ized raw material is influencing the coefficient of thermal expansion of the cordierite ceramic object which consists of this ceramic-ized raw material and the diameter of a primary particle becomes small, it is in the inclination for a coefficient of thermal expansion to deteriorate.

[0085]

Moreover, as shown in drawing 8 , a significant correlation is between the diameter of a primary particle of a ceramic-ized raw material, and the particle size of a grinding particle. That is, when particle size of a grinding particle is made detailed, it is in the inclination for the diameter of a primary particle of a ceramic-ized raw material to become small.

And 1mm or more, then detailed-ization of a primary particle can be further controlled for the particle size of a grinding particle.

[0086]

Furthermore, the viscosity of the humidification raw material formed in the above-mentioned forming cycle based on several sorts of grinding particles from which particle size differs as the 5th experiment was measured. Consequently, as shown in drawing 11 , between the particle size of a grinding particle, and the viscosity of the above-mentioned humidification raw material, it was able to find out that there was a high correlation.

[0087]

That is, according to this drawing the mean particle diameter of the applied grinding particle being shown on an axis of abscissa, and showing the viscosity of a humidification raw material on an axis of ordinate, it turns out that the viscosity of a humidification raw material falls [the mean particle diameter of a grinding particle] rapidly in less than 1mm.

On the other hand, in 1mm or more, the viscosity of a humidification raw material has a stable particle size of a grinding particle.

[0088]

It is presumed that the cause that the viscosity of a humidification raw material falls, as for artificers is for cutting the ether linkage which is combining the hydroxy propoxy group of the methyl cellulose as a binder mutually, and deteriorating.

So, ether linkage is cut, so that a grinding particle is made fine, the methyl cellulose as a binder deteriorates, and the viscosity of the above-mentioned humidification raw material falls. According to drawing 11 , it actualizes in the field of less than 1mm of grinding particles, and this inclination has little effect at 1mm or

more of grinding particles.
[0089]
Thus, degradation of the methyl cellulose contained as a binder can be controlled by setting particle size of a grinding particle to 1mm or more.
And by controlling degradation of a binder, the methyl cellulose as a binder in the above-mentioned unnecessary section can also be made refreshable, and can improve further the regeneration efficiency in the above-mentioned whole production process.
[0090]
(Example 3)
This example is an example which investigated the effect by the content ratio of the grinding particle in the above-mentioned mixed process based on the production process of the cordierite ceramic object of an example 1.
In this example, the coefficient of thermal expansion was investigated about the cordierite ceramic object which changed and manufactured the content of the grinding particle occupied in the above-mentioned whole ceramic-ized raw material of the above-mentioned mixed process between the 0 weight section - 100 weight sections.
[0091]
It turns out that the coefficient of thermal expansion of the cordierite ceramic object produced from this ceramic-ized raw material becomes large as the coefficient of thermal expansion of the cordierite ceramic object manufactured in the content ratio of a grinding particle by the axis of abscissa is shown in drawing 12 expressed to an axis of ordinate and the content of the grinding particle in a ceramic-ized raw material is increased.
[0092]
And among this drawing, in order to control to the coefficient of thermal expansion of the cordierite ceramic object which consists only of a virgin raw material to less than 10% of degradation (range show with an alternate long and short dash line among this drawing.) according to the data (a continuous line and a rhombus plot show) about a grinding particle with a particle size of 1-5mm, it turns out that it is necessary to maintain the content of the above-mentioned grinding particle below in 30 weight sections.
[0093]
In addition, change (a dotted line and a black dot plot show.) of the coefficient of thermal expansion of the cordierite ceramic object produced from the ceramic-ized raw material which contains in drawing 12 as reference the grinding particle ground in particle size of 0.5-1mm is shown. When the particle size of a grinding particle is small, the result of the example 2 that degradation of a coefficient of thermal expansion is large is supported.
[0094]
Furthermore, the viscosity of the above-mentioned humidification raw material which humidified the ceramic-ized raw material containing the above-mentioned grinding particle is investigated experimentally, and the result is shown in drawing 13 . The content of a grinding particle is expressed with this drawing axis of abscissa, and the viscosity of a humidification raw material is expressed to the axis of ordinate.
In addition, in the mixed process of this example, only the methyl cellulose according to the content of the virgin raw material in a ceramic-ized raw material is mixed. It is for actualizing degradation of a binder with a possibility that it may be generated in the grinding particle.
Therefore, when having produced degradation to the binder of a grinding particle, extent of the degradation will be actualized as a fall of the viscosity of the above-mentioned humidification raw material.
[0095]
According to this drawing, according to the grinding particle (a continuous line shows) with a particle size of 1-5mm, even if it changes the content in a mixed process, there is little fluctuation of the viscosity of the above-mentioned humidification raw material. By the grinding particle with a particle size of 1-5mm, it is because degradation of a binder can be controlled.
In addition, the result depended on the same experiment as reference about a grinding particle (a dotted line shows among this drawing) with a particle size of 0.07-0.5mm is shown. According to this experimental result, the fall of the viscosity of the humidification raw material according to degradation of a binder at a detailed grinding particle with a particle size of 0.5mm or less is distinct.
[0096]
In addition, if the content of the above-mentioned grinding particle is maintained below in 30 weight sections, degradation of a binder can be controlled, and also the effectiveness that it can control that a huge

secondary particle is generated at the above-mentioned humidification process can be acquired.
And a possibility that troubles, such as blinding of a die and plugging of a making machine, may occur can be controlled by controlling generation of the huge secondary particle which the grinding particle condensed.
[0097]
By the manufacture approach of using the grinding particle as a playback ceramic-ized raw material, a huge secondary particle is easy to be generated in the above-mentioned humidification process. Artificers think that this cause is in the binder in a grinding particle.
From the mixed raw material which mixed the virgin raw material and the new binder, as shown in drawing 14 , the primary particle 707 of a ceramic-ized raw material and the primary particle 709 of a binder 121 exist according to an individual.
[0098]
On the other hand, by the grinding particle 74 as a playback ceramic-ized raw material, as shown in drawing 15 , it once melts, and the primary particle 708 covered with the thin-film-ized binder 121 condenses, and the secondary particle 704 is formed. And in a humidification process, if the secondary particle 704 and mixed liquor come into contact with, the thin film-like binder 121 will produce adhesiveness and the secondary particle 704 whole will come to demonstrate adhesiveness.
And mutual adhesion of secondary particle 704 is the cause which generates a still huger secondary particle.
[0099]
Then, like the above, as the content of the grinding particle 74 to the virgin raw material 100 weight section is shown in below 30 weight sections, then drawing 16 , the primary particle 707 of a virgin raw material changes into a rich condition to the secondary particle 704.
The primary particle 707 of a virgin raw material can be made to adhere to the periphery of the secondary particle 704 in this condition. And if it is in the secondary particle 705 generated in this way, there are few possibilities of the outside surface not demonstrating an adhesive property, but carrying out huge further.
[0100]
(Example 4)
This example is an example which changed the generation method of the playback ceramic-ized raw material in the manufacture approach of the cordierite ceramic object 8 of an example 1.
In this example, it replaced with the above-mentioned grinding particle as a playback ceramic-ized raw material of an example 1, and the playback powder 75 which fine-particles-ized the above-mentioned unnecessary section 888 was applied. Moreover, it replaced with the playback process of an example 1, and the fine-particles chemically-modified degree S190 was carried out in this example. These contents are explained using drawing 17 - drawing 19 .
[0101]
At the mixed process S120 of this example, as shown in drawing 17 , the methyl cellulose powder, the virgin raw material 70, and the above-mentioned playback powder 75 as a binder 121 were mixed, and the above-mentioned mixed raw material 72 was generated.
That is, in this example, the virgin raw material 70 and the raw material which consists of playback powder 75 of 30 weight sections to this virgin raw material 70 were used as the ceramic-ized raw material 71 applied to the above-mentioned mixed process S120.
[0102]
In addition, in this example, the input of a binder 121 was adjusted according to the content of the playback powder 75 in the ceramic-ized raw material 71 of the mixed process S120. That is, it is for there being a possibility that lubricity may run short, with the playback powder 75 to which water of crystallization transpired by baking mentioned later, and compensating by increase in quantity of a binder 121.
In this example, the injection ratio of the proper binder 121 to the playback powder 75 was greatly set up compared with the injection ratio of the proper binder 121 to the virgin raw material 70.
In addition, the effect by the water of crystallization of the playback powder 75 is also suppliable by replacing with increase in quantity of the above-mentioned binder 121, and increasing the quantity of the input of the mixed liquor 131 of the humidification process S130.
[0103]
In this example, as shown in drawing 17 , in order to generate a playback ceramic-ized raw material, the fine-particles chemically-modified degree S190 is carried out as a back process of the above-mentioned cutting process S160.
To the fine-particles chemically-modified [of this example] degree S190, the collected unnecessary section

888 is calcinated and the playback powder 75 is generated.
[0104]
To the fine-particles chemically-modified degree S190, the above-mentioned unnecessary section 888 is calcinated in 700-degree-C ambient atmosphere with the electric furnace which is not illustrated. And the powder-like playback powder 75 is generated from the unnecessary section 888 by vanishing the methyl cellulose as a binder 121 contained in the unnecessary section 888.
And in the mixed process S120, the generated playback powder 75 is reused like the above.
[0105]
Thus, in the production process of the cordierite ceramic object 8 of this example, the unnecessary section 888 collected from the cutting process S160 to the fine-particles chemically-modified [above-mentioned] degree S190 is calcinated and fine-particles-ized, and the powder-like playback powder 75 is reproduced.
And to the fine-particles chemically-modified [this] degree S190, there are few possibilities of grinding etc. not carrying out the unnecessary section 888 and destroying a primary particle.
Therefore, there are few possibilities of originating in a difference of the particle size of the primary particle in both raw materials, and producing a difference of a coefficient of thermal expansion between the cordierite ceramic object 8 produced from the ceramic-ized raw material 71 containing this playback powder 75 and the cordierite ceramic object 8 produced from the virgin raw material 70.
Furthermore, the manufacture approach of this example which mixes the playback powder 75 and the virgin raw material 70 in the mixed process S120 can divert the existing manufacturing installation by the virgin raw material, and is efficient.
[0106]
Moreover, in this example, the experiment which investigates the particle size distribution of the primary particle of the playback powder 75 and the virgin raw material 70 was conducted. Consequently, as shown in drawing 18 , it turned out that the big difference has not appeared in distribution of particle diameter between the playback powder 75 (a continuous line shows among this drawing.), and the virgin raw material 70 (a thin line shows among this drawing.). In addition, the particle diameter of a primary particle is shown on this drawing axis of abscissa, and the incidence is shown on the axis of ordinate.
In addition, the diameter distribution of a primary particle of the above-mentioned grinding particle (a dotted line shows.) as a playback ceramic-ized raw material of an example 1 is shown in this drawing as reference data.
[0107]
Furthermore, the experiment which investigates a coefficient of thermal expansion was conducted about some cordierite ceramic objects 8 produced only from the playback powder 75, and some cordierite ceramic objects 8 produced only from the virgin raw material 70. Consequently, as shown in drawing 19 , it turned out that distribution of the coefficient of thermal expansion of the cordierite ceramic object produced from the playback powder 75 shown as a sample 1 is mostly in agreement with coefficient-of-thermal-expansion distribution of the cordierite ceramic object produced from the virgin raw material 70 shown as a sample 2.
In addition, distribution of the coefficient of thermal expansion of some cordierite ceramic objects (sample 3) produced from the above-mentioned grinding particle as a playback ceramic-ized raw material of an example 1 is shown in this drawing as reference data.
[0108]
Thus, according to the fine-particles chemically-modified [above-mentioned] degree S190, as shown in drawing 18 , the primary particle in the playback powder 75 is not made detailed.
And according to the playback powder 75 which presents the diameter distribution of a primary particle equivalent to the virgin raw material 70, as shown in drawing 19 , the cordierite ceramic object 8 excellent in the coefficient of thermal expansion is producible.
[0109]
Like the above, it is also possible enough to produce the cordierite ceramic object 8 only from the above-mentioned playback powder 75.
However, if the amount of the unnecessary section 888 as scrap wood produced in the production process is taken into consideration, it is desirable to set the content of the playback powder 75 below to 30 weight sections more than 1 weight section to the virgin raw material 70 of the 100 weight sections of the above-mentioned mixed process S120.
[0110]
If the content of the playback powder 75 is in the above-mentioned range, the cordierite ceramic object 8 by which quality was stabilized can be continuously manufactured efficiently from the ceramic-ized raw

material 71 which mixed the newly supplied virgin raw material 70 and the playback powder 75.
In addition, about the other configurations and operation effectiveness, it is the same as that of an example 1.
[0111]
(Example 5)
This example is an example which changed the raw material combination supplied to the approach and the above-mentioned mixed process of reuse of the above-mentioned unnecessary section 888 based on the manufacture approach of the cordierite ceramic object of an example 1.
This example is an example which constituted directly the unnecessary section 888 which skipped the above-mentioned playback process and were collected from the cutting process S160 so that it might use, as shown in drawing 20 .
And in the mixed process S120, it constitutes so that the mixed raw material 72 which mixed the virgin raw material 70 and the methyl cellulose as a binder 121 may be generated.
[0112]
Furthermore, in this example, as shown in drawing 21 , the making machine 140 constituted so that the humidification process S130 and a forming cycle S140 could be carried out to coincidence is used.
This making machine 140 has strengthened kneading torque so that the above-mentioned unnecessary section 888 can be directly supplied from ingredient input port 145.
And by the manufacture approach of the cordierite ceramic object 8 of this example, the above-mentioned mixed raw material 72, mixed liquor 131, and the unnecessary section 888 are supplied to the above-mentioned making machine 140, and the above-mentioned humidification process S130 and the above-mentioned forming cycle S140 are carried out to coincidence.
[0113]
Thus, by the manufacture approach of this example, retempering is directly carried out with a making machine 140, without also performing any processing to the above-mentioned unnecessary section 888.
Therefore, according to this manufacture approach, there are few possibilities of producing detailed-izing of the diameter of a primary particle in the unnecessary section 888, degradation of a binder 121, etc. So, there are few possibilities that the quality of the cordierite ceramic object 8 produced by this manufacture approach may deteriorate.
[0114]
About the other configurations and operation effectiveness, it is the same as that of an example 1.
In addition, in order to enforce this manufacture approach, improvement in refrigeration capacity etc. may be needed as a cure of the increment in calorific value at the time of kneading besides strengthening of the kneading torque of the above-mentioned making machine 140.
[Brief Description of the Drawings]
[Drawing 1] Process drawing showing the production process of the cordierite ceramic object in an example 1.
[Drawing 2] The perspective view showing the cordierite ceramic object in an example 1.
[Drawing 3] The explanatory view showing the situation of operation of raw material down stream processing in an example 1.
[Drawing 4] The sectional view showing the structure of a making machine in an example 1 of carrying out a forming cycle.
[Drawing 5] The explanatory view showing the wire cutting machine in an example 1.
[Drawing 6] The explanatory view showing signs in an example 1 that a playback process is carried out.
[Drawing 7] The graph which shows the relation between the mean diameter of the grinding particle in an example 2, and the coefficient of thermal expansion of a cordierite ceramic object.
[Drawing 8] The graph which shows distribution of the diameter of a primary particle in a grinding particle in an example 2.
[Drawing 9] The graph which shows distribution of the diameter of a primary particle of each raw material component in a virgin raw material in an example 2.
[Drawing 10] The graph which shows the amount of preferred orientation of the primary particle in the cordierite ceramic object in an example 2, and relation with a coefficient of thermal expansion.
[Drawing 11] The graph which shows the relation between the mean particle diameter of the primary particle in a grinding particle in an example 2, and the viscosity of the humidification raw material produced from this grinding particle.
[Drawing 12] The graph which shows the relation between the content of the grinding particle to the inside

of a ceramic-ized raw material, and a virgin raw material in an example 3, and the coefficient of thermal expansion of the cordierite ceramic object produced from this ceramic-ized raw material.
[Drawing 13] The graph which shows the relation between the content of the grinding particle to the inside of a ceramic-ized raw material, and a virgin raw material in an example 3, and the viscosity of the humidification raw material produced from this ceramic-ized raw material.
[Drawing 14] The explanatory view showing the condition of a primary particle in the mixed raw material in an example 3 which mixed the virgin raw material and the powder-like binder.
[Drawing 15] The explanatory view showing the condition of the primary particle of the grinding particle in an example 3.
[Drawing 16] The explanatory view showing the condition of the secondary particle which the primary particle of the grinding particle in an example 3 and the primary particle of a virgin raw material condensed.
[Drawing 17] Process drawing showing the production process of the cordierite ceramic object in an example 4.
[Drawing 18] The graph which shows distribution of the diameter of a primary particle in playback powder in an example 4.
[Drawing 19] The graph which shows the distribution of the coefficient of thermal expansion of the cordierite ceramic object produced from playback powder in an example 4.
[Drawing 20] Process drawing showing the production process of the cordierite ceramic object in an example 5.
[Drawing 21] The sectional view showing the structure of a making machine of carrying out the humidification process and forming cycle in an example 5.
[Description of Notations]
121 ... a binder,
131 ... mixed liquor,
14,140 ... a making machine,
15 ... a wire cutting machine,
70 ... (new article) -- a ceramic-ized raw material,
71 ... (it applies to a mixed process) -- a ceramic-ized raw material,
72 ... a mixed raw material,
73 ... a humidification raw material,
74 ... a grinding particle,
704...(fine-particles particle) primary particle,
705...(fine-particles particle) secondary particle,
75 ... playback powder,
8 ... a cordierite ceramic object,
80 ... a cel,
81 ... an envelope,
82 ... a septum,
88 ... a ceramic Plastic solid,
888 ... the unnecessary section,

[Translation done.]

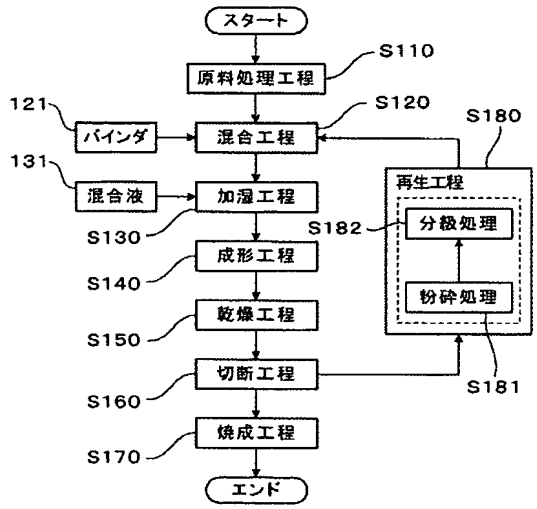
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

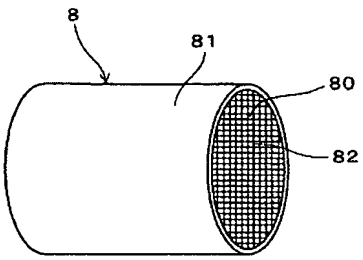
[Drawing 1]

(図1)



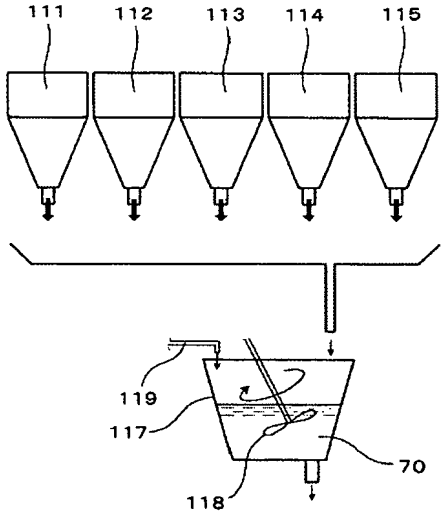
[Drawing 2]

(図2)



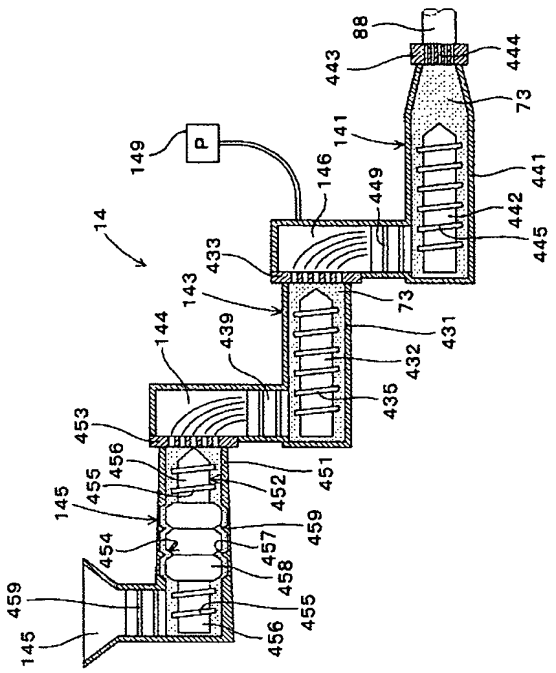
[Drawing 3]

(図3)



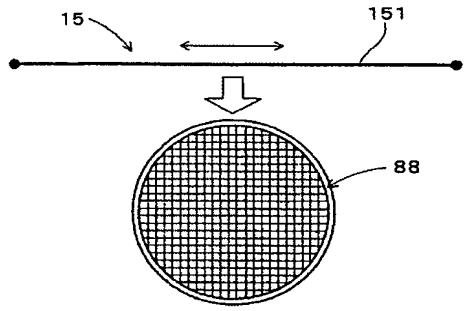
[Drawing 4]

(図4)



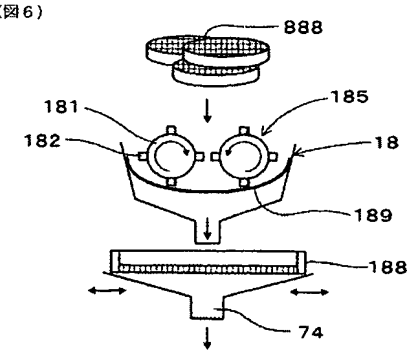
[Drawing 5]

(図5)

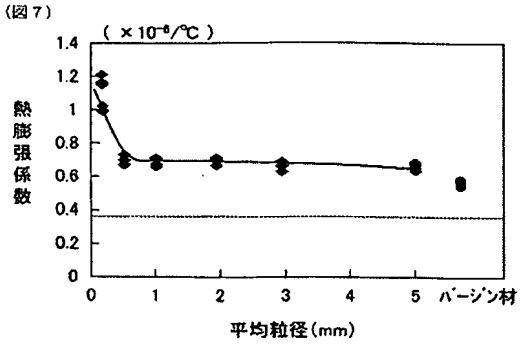


[Drawing 6]

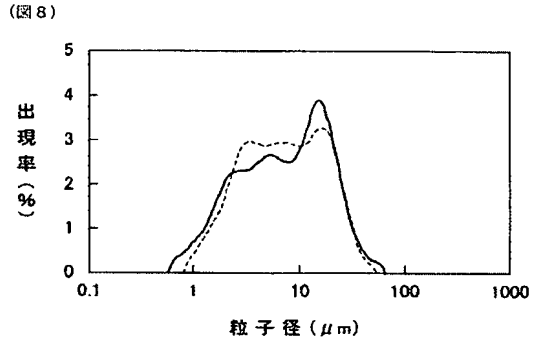
(図6)



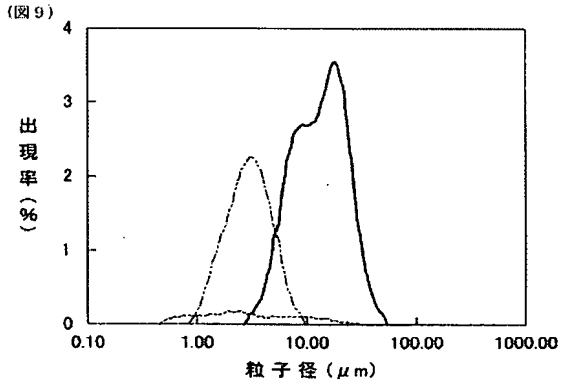
[Drawing 7]



[Drawing 8]

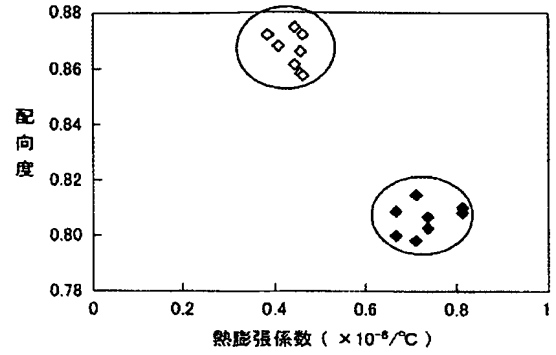


[Drawing 9]



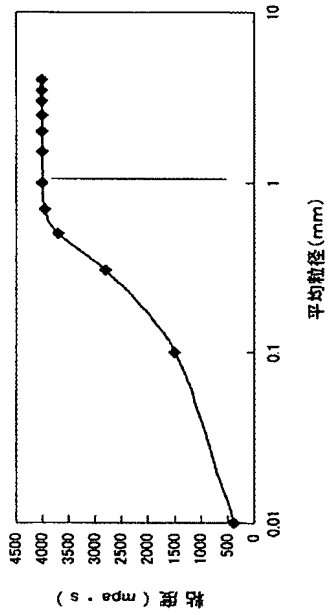
[Drawing 10]

(図１０)



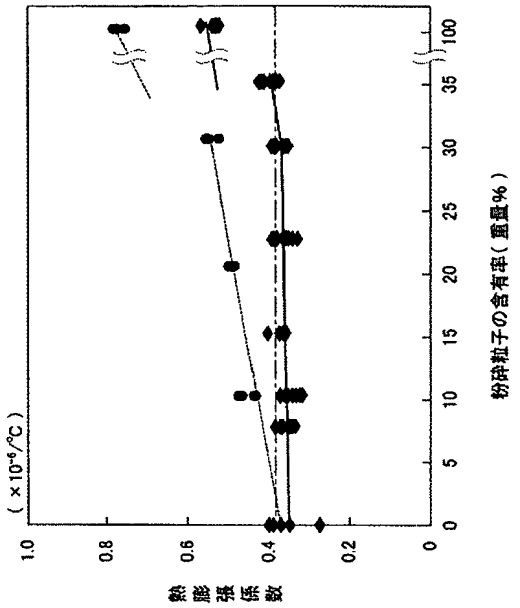
[Drawing 11]

(図１１)



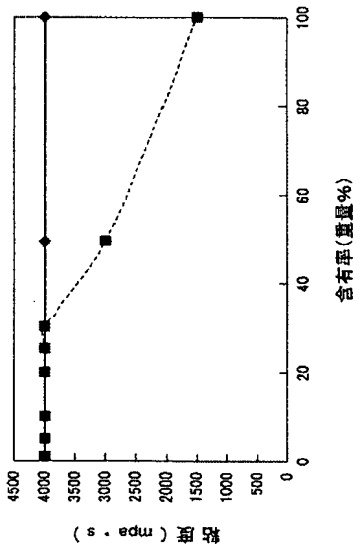
[Drawing 12]

(図１２)



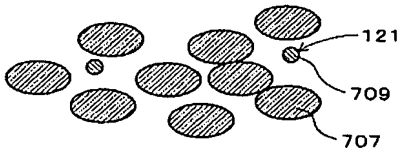
[Drawing 13]

(図１３)



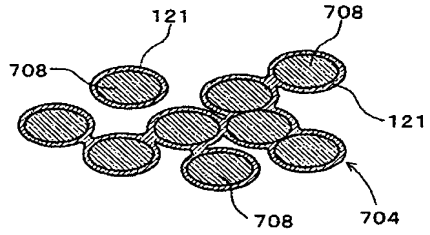
[Drawing 14]

(図14)



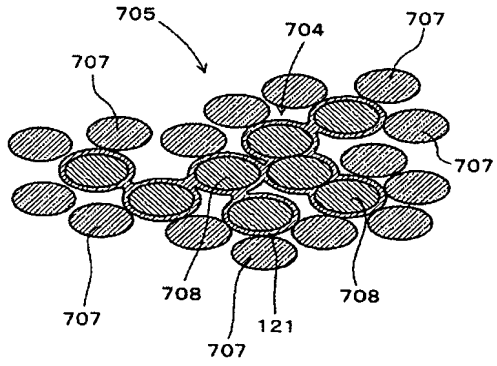
[Drawing 15]

(図15)



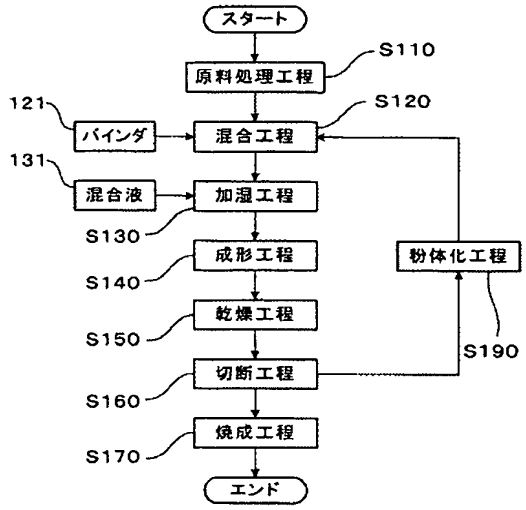
[Drawing 16]

(図16)



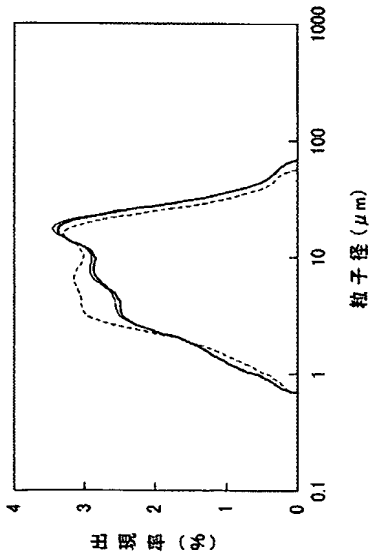
[Drawing 17]

(図１７)



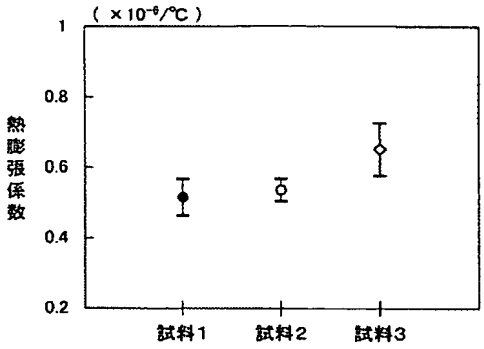
[Drawing 18]

(図１８)



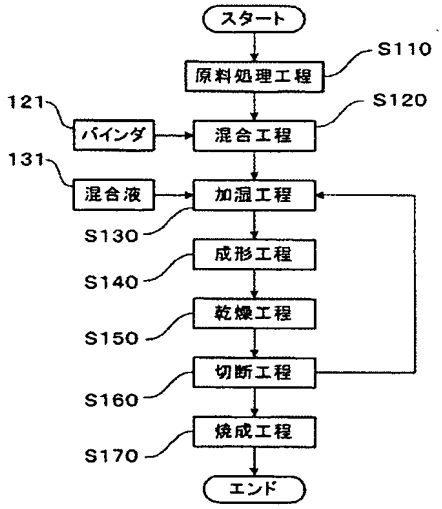
[Drawing 19]

(図19)



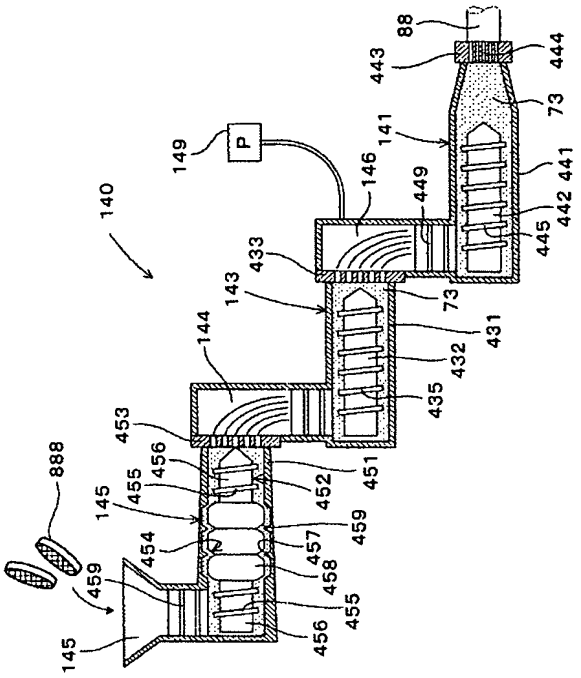
[Drawing 20]

(図20)



[Drawing 21]

(図２１)



[Translation done.]